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November 8, 1999  
(Via Certified Mail)

Mr. Kevin Turner  
Environmental Scientist, OSC  
U. S. Environmental Protection Agency  
c/o Crab Orchard National Wildlife Refuge  
8588 Rt. 148, Marion, IL 62959

**Re: June 21, 1999 U. S. EPA UAO - Docket No. V-W-99-C-554**  
**Dead Creek Culverts - Sauget Area I ("UAO")**  
• **Alternatives Analysis**

Dear Mr. Turner,

In an October 29, 1999 letter in response to the referenced matter, Solutia submitted the design and schedule for culvert replacements at Cargill Road and the Terminal Railroad Right-of-way. As we have recently discussed, work is now in progress on the culvert replacements according to the submitted plans. In that same October 29, 1999 correspondence, Solutia committed to deliver to the U. S. Environmental Protection Agency ("EPA") by November 8 an evaluation of alternatives to an on-site containment cell for dealing with the contaminated sediments from Creek Sector B ("CS-B") and Site M, and to a December 3 date for submittal of an on-site containment cell design for those same sediments. The on-site containment cell design is in progress and will be submitted by December 3 as promised. The detailed evaluation of alternatives to an on-site containment cell is enclosed herewith.

Conclusions from the alternatives analysis for dealing with the contaminated sediments from CS-B / Site M are summarized as follows:

- Off-site incineration

EPA identified an incinerator contractor at a facility in St. Ambroise, Quebec willing to accept the CS-B / Site M sediments.

The export of PCB containing wastes (>50 PPB) is banned by US law, unless the EPA grants a waiver for their export. Exporting of PCB containing wastes is also discouraged by EPA policy. In addition, Canada has its own import restrictions that would have to be overcome.

In addition to the regulatory and policy hurdles, the known presence of volatile metals, such as lead and zinc, and the highly probable presence of dioxins (sample analysis now in progress), would make it technically infeasible to incinerate CS-B / Site M sediments at most locations. Only one facility in the US (Coffeyville, Kansas) is permitted to incinerate dioxin containing materials. The facility burns dioxins on a campaign basis and charges \$5.00/pound.

- Off-Site Disposal

Removal and off-site disposal of CS-B / Site M sediments would protect public health and the environment by containing them in a secure, properly permitted commercial landfill.

RCRA Land Disposal Restrictions would require that the sediments be pretreated prior to land disposing since several (at least 5) of the semi-volatile organic constituents have average concentrations in excess of the Universal Treatment Standard ("UST"). For organic constituents, incineration is presumed to be the pretreatment method (same problems as above), although thermal treatment and solvent extraction can also be used to achieve the UST. In all cases, because of the requirement for pretreatment, it would not be possible to complete the planning process within the six month time frame required for a time-critical removal action.

- On-site containment / Cost Comparison

On-site containment is a cost-effective remedy that can be implemented as a short-term removal action (< 6 months) or as a long-term remedy. It provides the same level of protection of public health and the environment as off-site incineration or off-site disposal at a significantly lower cost:

Off-Site Incineration	\$10,500,000 to \$16,900,000
Off-Site Disposal	\$8,000,000 to \$10,000,000
On-Site Disposal	\$2,000,000 to \$2,500,000

In summary, on-site containment will meet the public's desire for action and will eliminate the potential for exposure to impacted sediments in a shorter time frame than either an off-site incineration removal action or an off-site removal action. Therefore, Solutia recommends proceeding with design and approval of an on-site containment cell for dealing with the contaminated sediments from CS-B / Site M. The on-site containment cell design is in progress and will be submitted by December 3 as promised. Solutia will continue to negotiate with EPA, in good faith, an enforceable commitment to implement the on-site containment cell, to be performed either under this UAO or another order.

Sincerely,



D. M. Light  
Manager, Remedial Projects  
Solutia Inc.

cc: Mr. Thomas Martin, Esq. - USEPA  
Mr. Mike McAteer - USEPA  
Mr. Steve Johnson - USEPA  
Ms. Candy Morin - IEPA

## 1.0 Introduction

On June 21, 1999, USEPA issued a Unilateral Administrative Order (UAO) requiring replacement of all culverts in Dead Creek to eliminate an alledged imminent threat to public health and the environment resulting from flooding. Solutia responded on July 15 and 30, 1999 indicating that culvert replacement would not solve the problem of flooding and proposed, as an alternative, a time critical removal action consisting of: 1) replacing culverts at Cargill Road and the Terminal Railroad Association (TRRA) embankment and clearing vegetation in the Dead Creek channel between Route 3 and Cargill Road, 2) pumping storm water from Creek Segment B to the American Bottoms POTW and 3) moving sediments from Creek Sector B to an on-site, double-lined containment cell. USEPA responded to this offer on September 24, 1999 indicating that culvert replacement and storm water pumping could proceed but movement of sediments to an on-site cell was outside the scope of the order.

Solutia voluntarily initiated an evaluation of culvert replacement in May 1999. This evaluation, completed in July 1999, indicated that replacing culverts at Cargill Road and the TRRA embankment would lower water levels at these locations by approximately 1.5 feet. As originally envisioned, the 48-inch culvert at Cargill Road would be replaced by a single 60-inch culvert and the 36-inch pipe at the TRRA embankment would be replaced by a V-notch cut. Engineering evaluation indicated that three 48-inch CMP culverts were needed at Cargill Road and that a V-notch cut could not be constructed at the TRRA embankment because two petroleum liquid pipelines and one gas pipelines were embedded in it. Discussions with the pipeline owners indicated that these pipelines had to be supported and that a V-notch cut in the embankment would threaten the stability of the pipelines. As a result, a culvert alternative was selected for the embankment consisting of four 66-inch CMP culverts and one 54-inch CMP culvert.

Work on installing these culverts is proceeding with access agreement negotiations initiated with St. Clair County, the Terminal Railroad Association and several other landowners in October 1999. The Agency was briefed on project status on Friday, October 29, 1999 and given a preliminary schedule for the culvert replacement removal action.

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Initial discussions of the feasibility of pumping storm water to American Bottoms was discussed with the POTW on September 28, 1999 and several issues were identified that needed resolution before pumping could occur: 1) identification of the constituents present in the storm water and determination of their concentrations, 2) determination if any of these compounds could not be treated by the American Bottoms system, 3) whether or not PCB concentrations would be above a regulatory limit of 3 parts per billion and 4) the impact of this discharge on sludge quality and the ability to dispose of this material in a municipal landfill. Work on these issues is in progress. However, Solutia does not propose to implement a storm water pumping system independent a sediment removal action. The culvert at the downstream end of Creek Segment B was blocked in 1965 although the Village of Sauget has installed a high-level overflow to prevent flooding of Judith Lane and a nearby residential area. Pumping was considered a stop gap measure to prevent downstream migration of impacted sediments during storm conditions prior to and during the sediment removal action. Since storm flows can exceed 52.2 cubic feet per second (23,400 gallons per minute), long term pumping and treatment of this discharge is impracticable.

Solutia met with the Agency on October 19, 1999 to discuss construction of a double-lined, on-site containment cell built to RCRA minimum technology standards to contain sediments removed from Creek Segment B. Representatives from both Superfund and TSCA were present at the meeting. Based on this meeting it appeared that Solutia could meet the substantive requirements for a TSCA cell and made a commitment to submit a containment cell design to the Agency on December 3, 1999. URS Greiner Woodward Clyde was authorized to prepare a RCRA minimum technology design that would meet TSCA requirements on October 28, 1999. In addition, URS was authorized to undertake a foundation evaluation of the proposed location of the containment cell. Current plans call for constructing this cell immediately adjacent to the west bank of Dead Creek just south of Site G on property owned by Solutia. During this meeting, the Agency requested that Solutia prepare an evaluation of three alternatives for handling sediment removed from Creek Segment B. Solutia committed to prepare an alternatives evaluation and submit it to the Agency on November 8, 1999.

This document responds to the Agency's October 19, 1999 request for an evaluation of three alternatives for handling sediment removed from Creek Segment B. Alternatives evaluated include: 1) removal and off-site treatment at an incinerator in St. Ambroise, Quebec, 2) removal and off-site disposal at a RCRA/TSCA landfill in Detroit, Michigan and 3) removal and on-site containment. The off-site disposal facilities were identified by the USEPA as potential sites for receiving excavated sediments.

## **2.0 Site Background**

Dead Creek, an intermittent stream which is slightly more than three miles long, runs from Queeny Avenue in Sauget, Illinois downstream to Old Prairie Dupont Creek in Cahokia, Illinois. IEPA divided the creek in six segments during past investigations: Creek Segments A, B, C, D, E and F (Figure 1). Six source areas exist in the headwaters of Dead Creek: Site G, Site H, Site I, Site L, Site M and Site N. Site I is located in Creek Segment A; Sites G, H, L and M are located in Creek Segment B. Site N is located in Creek Segment C and will not be discussed as part of this alternatives evaluation. Wastes in these source areas, which have an estimated total area of more than 30 acres, came from a wide variety of municipal and industrial sources between the 1930s and 1980s. Current Agency estimates indicate that these sites have a total volume in excess of 400,000 cubic yards. Waste disposal has been a common land use throughout the history of the upstream portions of the site.

### **2.1 Creek Segment A**

Creek Segment A (CS-A) is no longer part of the Dead Creek watershed as a result of a remedial action conducted by Cerro Copper in 1990/1991. This creek segment, and downstream segments that were not blocked off, received direct waste water discharges from industrial sources and also served as a surcharge basin for the Village of Sauget municipal sewer system. When the sewer system backed up or overflowed, untreated wastes from industrial users were direct discharged to CS-A. CS-A was dredged a number of times to

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remove accumulated sediment and dredge spoil was placed on the creek banks and in Site I, a fill area located immediately east of Dead Creek.

In 1968 the Queeny Avenue culvert, which allowed creek water to pass from CS-A to Creek Sector B (CS-B), was permanently blocked by the Village of Sauget. Cerro Copper performed an IEPA-approved remedial action for CS-A in 1990 and 1991. Approximately 20,000 cubic yards of impacted sediments were excavated from depths of 10 to 15 ft below grade and transported off site for disposal at the Waste Management landfill in Emelle, Alabama. After excavation, an HDPE vapor barrier was installed and CS-A was backfilled. The site is now fenced and used as a controlled-access truck parking lot.

According to the AOC, prior to remediation sediments in CS-A contained the following constituents:

<u>VOCs (parts per million)</u>		<u>SVOCs (parts per million)</u>	
Chlorobenzene	31	Acetophenone	24
1,2-Dichloroethene	15	4-Chloroaniline	17
Ethylbenzene	80	Pentachlorobenzene	37
Tetrachloroethene	11	Phenanthrene	14
Trichloroethene	100	Pyrene	10
Xylene	500	1,2,4,5-Tetrachlorobenzene	28
<u>Pesticides/PCBs (parts per million)</u>		<u>Metals (parts per million)</u>	
PCBs	3,145	Arsenic	194
		Antimony	356
		Cadmium	532
		Copper	91,800
		Lead	32,400
		Mercury	124
		Nickel	6,940
		Selenium	42
		Silver	348
		Zinc	26,800

**Site I** - Site I is located north of Queeny Road, west of Falling Springs Road, south of the Alton and Southern Railroad and east of Dead Creek. The site, which covers an area of

approximately 19 acres, is graded and covered with crushed stone and used as a truck parking and equipment storage area by Cerro Copper, the owner of the site. Sauget's Village Hall is located on the southeastern portion of the site. Cerro Copper is located west of the site and several small commercial operations are located east of the site. A small residential area of approximately 50 homes is located to the southeast. Runoff drains north to a collection sump that discharges to a pretreatment plant and then to a POTW. Site I is stable because it underlies a large, fenced, controlled-access, gravel-covered parking lot, the Sauget Village Hall and paved parking lots.

Site I, originally a sand and gravel pit, is connected to Site H (discussed below) beneath Queeny Avenue (Queeny Avenue was built on top of the fill area) and together they were known as the "Sauget-Monsanto Landfill". Disposal of chemical and municipal wastes occurred from 1931 to 1957 resulting in an estimated fill volume of 250,000 cubic yards. Based on information contained in the AOC, maximum detected constituent concentrations in Site I soils are:

**VOCs (parts per million)**

Benzene	24
Chlorobenzene	127
Ethylbenzene	15
Tetrachloroethene	5
1,1,1-Trichloroethane	2
Toluene	78
Trichloroethene	4
Xylenes	19

**SVOCs (parts per million)**

1,2-Dichlorobenzene	324
1,3-Dichlorobenzene	70
1,4-Dichlorobenzene	1,837
Hexachlorobenzene	1,270
Napthalene	514

**Pesticides/PCBs (parts per million)**

4,4-DDD	30
4,4-DDT	4
Toxaphene	493
Aroclor 1260	343

**Metals/Inorganics (parts per million)**

Beryllium	1,530
Copper	630
Lead	23,333
Zinc	6,329
Cyanide	3,183

**2.2 Creek Segment B**



CS-B, which is now the upstream portion of Dead Creek, extends for approximately 1800 ft. from Queeny Avenue to Judith Lane. In 1965 the culvert at Judith Lane, the downstream end of CS-B, was blocked to prevent downstream flow of water. Sites G, H and L, which are described below, border this creek segment. Land use surrounding CS-B is primarily commercial and agricultural. Commercial land use occurs along Route 3 (Mississippi Avenue), Queeny Road and Falling Springs Road. Undeveloped land is used for agriculture with soy beans and winter wheat being the primary crops. A small residential area of approximately 20 homes is located on Walnut Street and Judith Lane in the southeastern corner of this creek segment.

Based on information contained in the AOC, maximum detected constituent concentrations in CS-B sediments are:

<u>VOCs (parts per million)</u>		<u>SVOCs (parts per million)</u>	
Benzene	0.1	Dichlorobenzene	12,000
Chlorobenzene	5.2	Chloronitrobenzene	240
Ethylbenzene	3.6	1,2-Dichlorobenzene	17
Toluene	0.8	1,4-Dichlorobenzene	220
Xylenes	540	Fluoranthene	11
		Phenanthrene	15
		Pyrene	13
		Trichlorobenzene	3,700
<u>Pesticides/PCBs (parts per million)</u>		<u>Metals (parts per million)</u>	
PCBs	10,000	Arsenic	6,000
		Cadmium	400
		Copper	44,800
		Lead	24,000
		Mercury	30
		Nickel	3,500
		Silver	100
		Zinc	71,000

**Site G** - Site G, located south of Queeny Avenue between Route 3 and Dead Creek, operated as a landfill from approximately 1952 to 1966. It covers an area of approximately five acres and contains an estimated 60,000 cubic yards of waste including oil pits, drums containing wastes,

paper wastes, documents and lab equipment. Intermittent disposal continued through 1988 when the site was fenced pursuant to a USEPA removal action funded by PRPs including Solutia. USEPA conducted a second removal action in 1995, excavating soils containing PCBs, organics, metals and dioxin, solidifying open oil pits and placing a clean soil cap approximately 18 to 24 inches thick. Currently, Site G is a stable, vegetated and secured area that is not being used. Surface water drains radially away from the site as a result of the installation of the clean soil cap.

Based on information contained in the AOC, maximum detected constituent concentrations in Site G soils are:

<u>VOCs (parts per million)</u>		<u>SVOCs (parts per million)</u>	
Benzene	45	Napthalene	5,429
Chlorobenzene	538	Pentachlorophenol	4,769
Chloroform	12	Phenol	178
Tetrachloroethene	59	2,4,6-Trichlorophenol	49
Xylenes	42		
<u>Pesticides/PCBs (parts per million)</u>		<u>Metals (parts per million)</u>	
4,4-DDE	135	Arsenic	123
Aroclor 1248	174	Barium	45,949
Aroclor 1260	5,300	Copper	2,215
		Lead	3,123
<u>Dioxin (parts per million)</u>		Mercury	34
Dioxin	45	Nickel	399
		Zinc	4,257

PCB and dioxin concentrations in waste material are 3,000 and 51 parts per million, respectively.

**Site H** - Site H is located south of Queeny Avenue, west of Falling Springs Road and west of the Metro Construction Company property in the Village of Sauget. It is essentially a grassy field across the street from Sauget Village Hall that occupies approximately five to seven acres of land. Recent inspection indicates the site is stable with a vegetative cover and no wastes exposed at the surface. Cinders are present at the surface in some areas of the site.

Commercial buildings and a self-storage facility are located on the site. A residential area of approximately 50 homes is located adjacent to the northeast corner of the site. Drainage is typically west toward CS-B, however, several small depressions capable of retaining rainwater are scattered across the site.

Chemical wastes were disposed at Site H from approximately 1931 to 1957. Wastes included drums of solvents, PCBs, paranitroaniline, chlorine, phosphorous pentasulfide and hydrofluosilic acid. Municipal wastes were also reportedly disposed at Site H. Waste volume is estimated to be 110,000 cubic yards. Based on information contained in the AOC, maximum detected constituent concentrations in Site H soils are:

<u>VOCs (parts per million)</u>		<u>SVOCs (parts per million)</u>	
Benzene	61	1,2-Dichlorobenzene	19,355
Chlorobenzene	452	1,4-Dichlorobenzene	30,645
Ethylbenzene	13	Fluoranthene	1,330
Tetrachloroethene	6	4-Nitroaniline	1,834
Toluene	76	Phenanthrene	2,114
Xylenes	24	1,2,4-Trichlorobenzene	7,581
<u>Pesticides/PCBs (parts per million)</u>		<u>Metals (parts per million)</u>	
4,4-DDD	<1	Arsenic	388
4,4-DDE	<1	Cadmium	294
4,4-DDT	<1	Copper	2,444
Aroclor 1260	18,000	Lead	4,500
		Mercury	4
		Nickel	15,097
		Silver	44
		Zinc	39,516

**Site L** - Site L, located on the east bank of Dead Creek immediately south of the Metro Construction Company property on Queeny Avenue, is comprised of two backfilled surface impoundments used by Wagner Trucking between 1971 and 1981 for disposal of wash water from truck cleaning operations. Currently, Site L, a cinder covered area of approximately 7,600 square feet, appears stable. Land use to the south and east is agricultural. Runoff from the site flows to CS-B. Based on information contained in the AOC, maximum detected constituent concentrations in Site L soils are:

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<u>VOCs (parts per million)</u>		<u>SVOCs (parts per million)</u>	
Benzene	4	2-Chlorophenol	2
Chloroform	20	Di-n-butyl Phthalate	3
Toluene	27	Pentachlorophenol	58
<u>Pesticides/PCBs (parts per million)</u>		<u>Metals (parts per million)</u>	
PCBs	500	Antimony	32
		Arsenic	172
		Nickel	2,392

**Site M** - Site M, located at the end of Walnut Street, is surface impoundment with a surface area of approximately 59,200 square feet, a maximum depth of 14 feet and a sediment volume of approximately 3,600 cubic yards. Used as a sand borrow pit in the mid to late 1940s it is now hydraulically connected to Dead Creek through an eight-foot wide opening at its southwestern corner. Its banks are well vegetated and there is no evidence of current erosion and/or transport of sediments to Dead Creek. For these reasons, the site is considered stable.

Based on information contained in the AOC, maximum detected constituent concentrations in Site M sediments are:

<u>VOCs (parts per million)</u>		<u>SVOCs (parts per million)</u>	
2-Butanone	14	Benzo(b)fluoranthene	15
		Chrysene	12
		1,2-Dichlorobenzene	26
		1,4-Dichlorobenzene	40
		Fluoranthene	21
		Pyrene	27
		1,2,4-Trichlorobenzene	14
<u>Pesticides/PCBs (parts per million)</u>		<u>Metals/Inorganics (parts per million)</u>	
PCBs	1,100	Antimony	41
		Arsenic	94
		Barium	9,060
		Cadmium	47
		Copper	21,000
		Lead	1,910

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Nickel	2,490
Silver	26
Zinc	31,600
Cyanide	1

### 3.0 Creek Sector B and Site M Conditions

#### 3.1 Sediment Chemistry

In 1998 Ecology and Environment, at the request of the Agency, compiled all existing analytical data for Dead Creek (Volume 1, Sauget Area 1 Data Tables/Maps, February 1998). Maximum detected constituent concentrations are given below:

<u>VOCs (parts per million)</u>		<u>SVOCs (parts per million)</u>	
Acetone	5	Acenaphthene	3
Benzene	<1	Acenaphthylene	<1
2-Butanone	14	Alkylbenzene	<1
Carbon Disulfide	<1	Anthracene	4
Chlorobenzene	13	Benzo(a)anthracene	9
Ethylbenzene	4	Benzo(b)fluoranthene	30
4-Methyl-2-Pentanone	<1	Benzo(k)fluoranthene	15
Tetrachloroethane	<1	Benzo(g,h,i)perylene	13
Toluene	5	Benzo(a)pyrene	10
Xylene	<1	Bis(2-ethylhexyl)phthalate	18
		Butylbenzylphthalate	2
		Chrysene	12
		Chloronitrobenzene	240
		2-Chlorophenol	<1
		Dibenzo(a,h)anthracene	4
		Dibenzofuran	2
		1,2-Dichlorobenzene	12,000
		1,3-Dichlorobenzene	4
		1,4-Dichlorobenzene	220
		2,4-Dichlorophenol	<1
		Di-n-butyl phthalate	<1
		Di-ni-octyl phthalate	3
		2,4-Dimethylphenol	<1
		Fluoranthene	21
		Fluorene	6
		Hexachlorobenzene	2
		Indeno(1,2,3-cd)pyrene	9
		Isophorone	<1
		2-Methylnapthalene	8
<u>PCBs (parts per million)</u>			
PCBs	17,000		
<u>Metals/Inorganics (parts per million)</u>			
Antimony	45		
Arsenic	306		
Barium	17,300		
Beryllium	3		
Boron	76		
Cadmium	400		
Chromium	400		
Cobalt	100		
Copper	44,800		
Lead	24,000		
Mercury	30		
Nickel	3,500		

<u>Metals/Inorganics (parts per million)</u>		<u>SVOCs (parts per million)</u>	
Selenium	602	4-Methylphenol	<1
Silver	100	Napthalene	10
Strontium	430	4-Nitrophenol	3
Thallium	4	Pentachlorophenol	2
Tin	32	Phenanthrene	15
Vanadium	100	Pyrene	27
Zinc	71,000	1,2,4-Trichlorobenzene	3,700
Cyanide	4	1,2,4-Trichlorophenol	5
		2,4,5-Trichlorophenol	<1
		2,4,6-Trichlorophenol	<1

80% (8 of 10) of the VOC maximum concentrations in CS-B sediment and soil are between <1 and 10 ppm and two (20%) are between 10 and 20 ppm. SVOC maximum concentrations are grouped as follows: 26 of 39 (67%) between <1 and 10 ppm, 6 of 39 (15%) between 11 and 20 ppm, 3 of 39 (8%) between 21 and 50 ppm and 4 of 39 (10%) greater than 100 ppm. Metals maximum concentration distributions are 5 of 20 (25%) between 1 and 50 ppm, 5 of 20 (25%) between 51 and 100 ppm, 5 of 20 (25%) between 101 and 1,000 ppm and 5 of 20 (25%) greater than 1000 ppm.

Using organic concentrations of greater than 100 ppm and metals concentrations of greater than 1,000 ppm to focus on constituents with the highest detected concentrations, the following summary statistics result:

	<u>Maximum Concentration</u>	<u>95<sup>th</sup> Confidence Interval</u>	<u>Arithmetic Mean</u>	<u>Geometric Mean</u>	<u>Minimum Concentration</u>
<b><u>Organics (ppm)</u></b>					
PCBs	17,000	5,200	9,706	108	<1
1,2-Dichlorobenzene	12,000	9,675	1,367	10	<1
1,2,4-Trichlorobenzene	3,700	1,679	342	11	<1
Chloronitrobenzene	240	236	203	201	170
<b><u>Inorganics (ppm)</u></b>					
Zinc	71,000	53,350	14,126	5,047	30
Copper	44,800	36,050	11,186	2,890	27
Lead	24,000	2,795	1,313	319	6

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	<u>Maximum Concentration</u>	<u>95<sup>th</sup> Confidence Interval</u>	<u>Arithmetic Mean</u>	<u>Geometric Mean</u>	<u>Minimum Concentration</u>
<b><u>Inorganics (ppm)</u></b>					
Barium	17,300	8,578	2,400	1,089	41
Nickel	3,500	3,000	937	367	12

### 3.2 Sediment Volume

**Creek Segment B** - Solutia evaluated removal of sediment from Creek Segment B in 1991/1992. As part of this evaluation, sediment volume was estimated by assuming an average channel bottom width and sediment depth of 20 ft and 2 ft, respectively. For a stream length of 1600 ft., the estimated sediment volume was 4,000 to 4,500 tons. This translates to 2,700 to 3,000 cubic yards using a conversion factor of 1.5 tons per cubic yard.

Recalculating to verify this estimate yields a sediment weight of 3,555 tons:

$$\begin{aligned}\text{Volume} &= 1600 \text{ ft} (20 \text{ ft})(2 \text{ ft}) \\ &= 64,000 \text{ ft}^3 \\ &= 2,370 \text{ yd}^3\end{aligned}$$

$$\begin{aligned}\text{Weight} &= 2,370 \text{ yd}^3 (1.5 \text{ tons/ yd}^3) \\ &= 3,555 \text{ tons}\end{aligned}$$

The difference between this calculated amount and the 4,000 to 4,500 volume estimate included in the 1991/1992 Solutia estimate is probablys due to rounding up of the volume to account for uncertainties in the assumptions of channel width and depth.

The northern 400 ft. of CS-B was not included in the Solutia estimate because access could not be obtained for this portion of the drainage channel. Estimated volume and weight for this stretch using the 1991/1992 estimate assumptions are:

$$\begin{aligned}\text{Volume} &= 400 \text{ ft} (20 \text{ ft})(2 \text{ ft}) \\ &= 16,000 \text{ ft}^3 \\ &= 593 \text{ yd}^3\end{aligned}$$

$$\begin{aligned}\text{Weight} &= 593 \text{ yd}^3 (1.5 \text{ tons/ yd}^3) \\ &= 890 \text{ tons}\end{aligned}$$

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With the 1991/1992 estimating methodology, the total estimated volume of sediment in CS-B is 2,963 yd<sup>3</sup> and the total estimated weight is 4,445 tons.

**Site M.** In 1991/1992 Solutia also estimated the volume of sediment in Site M to be 3,800 yd<sup>3</sup> with a weight of 5,000 tons. To verify this estimate, an average sediment thickness of 1.6 feet was calculated from Site M sediment thickness measurements included in the 1991 Geraghty and Miller report "Site Investigation for Dead Creek Sector B and Sites L and M, March 1992". With this average sediment thickness, the estimated sediment volume in Site M is:

$$\begin{aligned}\text{Volume} &= 59,200 \text{ ft}^2 (1.6 \text{ ft}) \\ &= 94,720 \text{ ft}^3 \\ &= \underline{3,508 \text{ yd}^3}\end{aligned}$$

$$\begin{aligned}\text{Weight} &= 3,508 \text{ yd}^3 (1.5 \text{ tons/ yd}^3) \\ &= 5,262 \text{ tons}\end{aligned}$$

This analysis verifies the original sediment volume and weight estimates for Site M.

**Creek Segment B and Site M Volume Estimate** - Based on work done by Solutia in 1991/1992 the total estimated volume of sediment in CS-B and Site M is 6,493 yd<sup>3</sup> with a total estimated weight of 9,445 tons. For planning purposes, the estimated volume of sediments in CS-B and Site M is 10,000 cubic yards with a weight of 15,000 tons.

#### 4.0 Alternatives Evaluation

Solutia agrees with the Agency that removing sediments from Creek Segment B is the best and fastest approach to eliminate the potential for human exposure to the impacted sediments. Sediment concentrations in this segment of the creek have concentrations of PCBs, copper, lead and zinc that should be prevented from moving downstream:



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<u>Constituent</u>	<u>Maximum Concentration (ppm)</u>	<u>Average Concentration (ppm)</u>
PCB	17,000	9,706
Copper	44,800	36,050
Lead	24,000	1,313
Zinc	71,000	14,126

Plugging the culvert at Judith Lane, the downstream end of CS-B, in 1965 limited the downstream movement of constituents. Installation of a high-level overflow by the Village of Cahokia could result in downstream migration of constituents during storm conditions as could storm flows large enough to cause overtopping of Judith Lane. Therefore, sediment removal is a positive action that will protect public health and the environment and demonstrate progress toward a Dead Creek remedy after a long period of study and evaluation. Since an EE/CA process is already underway for soil, surface water, sediments and air, a time-critical removal action with a maximum planning process of six months duration is the best procedural vehicle for moving forward.

As mentioned in the Introduction, the Agency asked Solutia to evaluate three removal alternatives: 1) removal and off-site incineration, 2) removal and off-site disposal and 3) removal and on-site containment. These three alternatives are evaluated below.

#### **4.1 Off-Site Incineration**

Removal and off-site incineration of CS-B sediments would provide a permanent solution, however, there are a number of issues that need to be resolved before off-site incineration could be implemented as a remedy.

USEPA identified an incineration contractor with a facility in St. Ambroise, Quebec willing to accept the CS-B sediments and who claimed to be able to transport and incinerate PCB containing wastes for \$250 to \$300 per ton. There is a significant regulatory barrier to using a

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Canadian incinerator to treat PCB-containing sediments, namely the export of PCBs. Export of PCB-containing wastes is banned under TSCA unless USEPA grants a waiver for their export. In the December 6, 1995 preamble to the proposed PCB rule, USEPA stated that "EPA believes that export of PCBs to other countries needs to be limited so as not to pose the risk of injury to the health or the environment in those countries and that to the maximum extent practicable, each nation should manage its own waste within its own borders" (59 CFR 62,817). In addition, Canada has its own PCB import restrictions. A conversation with USEPA Washington indicates that it could take two to three years to obtain the waiver needed to export PCBs. This will not fit within the six month planning time frame of a time-critical removal action.

If the regulatory issues could be addressed in a timely manner, the known presence of volatile metals, such as lead and zinc, and the suspected presence of dioxins may make it technically infeasible to incinerate CS-B sediments. Lead occurs in CS-B sediments with a maximum concentration of 24,000 ppm and an average concentration of 1,313 ppm. Air emission control systems on incinerators are not typically designed to handle lead concentrations of this magnitude. With a maximum concentration of 71,000 ppm and an average concentration of 14,126 ppm, zinc may also overload an incinerator's air emission control system.

Dioxin was detected in Site G soils at a maximum concentration of 45 ppm and in waste material at a maximum concentration of 51 ppm. Given the proximity of Site G to Creek Segment B it is reasonable to assume that dioxin will be present in the sediments. Most incinerators have permit restrictions that preclude treating dioxins. Only one facility in the US (Coffeyville, Kansas) is permitted to burn them. This facility burns dioxin on a campaign basis and charges \$5.00 per pound.

Another issue associated with off-site incineration is cost. Bennett Environmental is claiming an all-in transportation and incineration cost of \$250 to \$300 per ton. If this is the actual cost range, then transportation and off-site incineration of 15,000 tons of impacted sediments would cost \$3,750,000 to 4,500,000. Experience indicates this cost is unrealistically low. Bennett states that low costs can be achieved by using barge or rail shipment. While shipping by barge or rail can lower shipping costs such shipping methods typically can not be for wastes or

Trucking is the only practical method for transporting sediments to St. Ambroise, Quebec, a distance of approximately 1350 miles. Typical costs for truck transportation range from \$2.50 to \$3.00 per mile. Transporting 15,000 tons of CS-B sediments would require 750 trips with 20 ton truck loads. Total transportation costs would range from \$2,500,000 to \$3,000,000.

Costs for an off-site incineration removal action will be in the range of \$10,500,000 to \$16,900,000 not including costs for engineering, project management, agency oversight, water treatment, etc.

Removal and off-site disposal of CS-B sediments would protect public health and the environment by containing the impacted sediments in a secure disposal facility. RCRA Land Disposal Restrictions will determine whether or not CS-B sediments can be land disposed without treatment. For organic constituents, treatment is presumed to be incineration although thermal desorption and solvent extraction can also be used to achieve the Universal Treatment

Standards. One of ten VOCs detected in CS-B sediments exceeded its UTS and 15 out of 39 detected SVOCs exceeded their UTS's:

<u>Regulated Constituent</u>	<u>Universal Treatment Standard (mg/kg)</u>	<u>Maximum Concentration (mg/kg)</u>	<u>Average Concentration (mg/kg)</u>
<b><u>VOCs</u></b>			
Chlorobenzene	6.0	13.0	2.7
<b><u>SVOCs</u></b>			
Anthracene	3.4	3.9	1.8
Benzo(a)anthracene	3.4	9.4	3.4
Benzo(b)fluoranthene	6.8	30.0	5.6
Benzo(k)fluoranthene	6.8	15.0	3.5
Benzo(a)pyrene	3.4	10.0	3.1
Chrysene	3.4	12.0	4.2
1,2-Dichlorobenzene	6.0	12,000.0	13,666.1
1,4-Dichlorobenzene	6.0	220.0	21.2
Fluoranthene	3.4	21.0	7.1
Fluorene	3.4	5.9	2.3
Indeno(1,2,3-cd)pyrene	3.4	9.0	2.2
Napthalene	5.6	9.5	2.9
Phenanthrene	5.6	15.0	4.5
Pyrene	8.2	27.0	9.2
1,2,4-Trichlorobenzene	19	3,700.0	342.6

Both maximum and average concentrations of six SVOCs exceed their Universal Treatment Standards: 1) Chrysene, 2) 1,2-Dichlorobenzene, 3) 1,4-Dichlorobenzene, 4) Fluoranthene, 5) Pyrene and 6) 1,2,4-Trichlorobenzene. While it may be possible to land dispose constituents whose maximum concentrations exceed their UTS, it is not possible to land dispose constituents whose average concentration exceeds their UTS unless their concentrations are reduced to less than the UTS by treatment. Since thermal treatment or solvent extraction would be required prior to land disposal of CS-B sediments, it is not possible to complete the planning process within a six month time frame. Therefore, a time-critical removal action could not include off-site disposal. In addition, the EE/CA that is currently being performed as part of the AOC for Sauget Area I is evaluating thermal treatment of wastes and sediments.

RCRA also limits land disposal of leachable metals and they are prevalent in CS-B sediments. TCLP data is available for four sediment samples from CS-B and two sediment samples from Site M:

<u>Regulated Constituent</u>	<u>Universal Treatment Standard - TCLP</u> (mg/l)	<u>TCLP Concentration</u> (mg/l)
Antimony	1.15	
Arsenic	5.0	< 0.20
Barium	21	3.7
Beryllium	1.22	
Cadmium	0.11	0.51
Chromium	0.60	< 0.50
Lead	0.75	0.52
Mercury	0.025	< 0.020
Nickel	11	
Selenium	5.7	< 0.50
Silver	0.14	< 0.010
Thallium	0.20	
Vanadium	1.6	
Zinc	4.3	

The Universal Treatment Standard for cadmium is exceeded and treatment is required before land disposal. Treatment will increase the duration and cost of the CS-B removal action.

RCRA also requires treatment of soil with regulated constituent concentrations greater than ten times the UTS. Soil must be treated so that the concentration of the regulated constituent is reduced by 90% or to a concentration ten times the UTS.

<u>Regulated Constituent</u>	<u>Universal Treatment Standard - 10X</u> (mg/l)	<u>Maximum Concentration</u> (mg/kg)	<u>Average Concentration</u> (mg/kg)
Antimony	11.5	45	33
Arsenic	50.0	306	45
Barium	210.0	17,300	2,400
Beryllium	12.2	3	2
Cadmium	1.1	400	54

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<u>Regulated Constituent</u>	<u>Universal Treatment Standard - 10X (mg/l)</u>	<u>Maximum Concentration (mg/kg)</u>	<u>Average Concentration (mg/kg)</u>
Chromium	6.0	400	96
Lead	7.5	24,000	1,313
Mercury	0.25	30	2
Nickel	110.0	3,500	937
Silver	1.4	100	25
Thallium	2.0	4	4

Maximum and average concentrations of antimony, barium, cadmium, chromium, lead, mercury, nickel, silver and thallium all are greater than ten times the Universal Treatment Standard. The maximum concentration of arsenic is also greater than ten times the UTS. Therefore, treatment is required before CS-B sediments can be land disposed off site. Treatment will increase the duration and cost of the CS-B removal action. With average barium, lead and nickel concentrations of 2,400, 1,313 and 937 ppm, respectively, it may be difficult to achieve the required 90% reduction in concentration to 240, 131 and 94 ppm, respectively.

Since CS-B sediments contain PCBs with concentrations greater than 50 ppm, any off-site disposal facility selected to receive excavated sediments would need a TSCA permit. As demonstrated above, a number of constituents present in CS-B sediments exceed UTS and treatment is required before land disposal off site. Organics need to be thermally treated or solvent extracted and metals need to be stabilized. USEPA identified a disposal facility (EQ) in Wayne, Michigan that is TSCA and RCRA permitted and located approximately 550 miles from the site. However, this facility is not permitted to stabilize PCB-containing materials, therefore, since stabilization of metals is required before land disposal, CS-B sediments can not be disposed there. Even if this facility could accept CS-B sediments, Solutia would be unwilling to use a disposal facility that it has never used before because of the future liability associated with disposal. Solutia, by policy, transports hazardous wastes to Emelle, Alabama. Exceptions to this policy are made, however, only to facilities where Solutia has transported wastes in the past, e.g. Model City, NY. Solutia has shipped arsenic-containing material from its Trenton,

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Michigan to Wayne Disposal. It is Solutia's understanding that a new, separate cell is used for TSCA-regulated materials at the nearby EQ disposal facility.

Dioxin, if present in CS-B sediments, will also make off-site disposal difficult because RCRA and TSCA disposal facilities are typically not permitted to receive materials containing this constituent.

In 1991/1992 Solutia evaluated off-site disposal by preparing its own estimate of removal and disposal costs and by soliciting bids from three contractors: 1) Chemical Waste Management, 2) Perland and 3) USPCI. Solutia's estimate and the contractors bids are summarized below:

<u>Task</u>	<u>Solutia</u>	<u>Chem. Waste Management</u>	<u>Perland</u>	<u>USPCI</u>
Design	568,590	15,000	30,000	14,900
Field Work	1,024,900	550,000	745,806	683,100
Transportation	1,846,000	495,000	1,124,900	0
Disposal	3,152,000	3,400,000	3,023,754	1,735,200
Infrastructure	960,000	960,000	960,000	960,000
PM, PR, Legal	<u>730,000</u>	<u>730,000</u>	<u>730,000</u>	<u>730,000</u>
Subtotal	8,281,490	6,150,000	6,613,750	4,123,000
Contingency(25%)	2,070,372	1,537,000	1,653,438	1,030,800
Total	10,351,862	7,687,500	8,267,188	6,184,000
Rounded	10,400,000	7,700,000	8,300,000	6,200,000
Facility	Emelle, AL	Emelle, Al	Emelle, Al	Grayback Mtn., UT
Distance	550 Miles	550 Miles	550 Miles	1,400 Miles
Shipping	Truck	Truck	Truck	Rail

No water treatment costs were included in the Solutia estimate or the contractor's bids.

Based on the contractor's bids, costs for off-site disposal of CS-B sediments range from \$6,200,000 to \$8,300,000. All of the contractors underestimate design costs with bids of \$15,000 to \$30,000. USPCI, a subsidiary a major railroad at the time of the bid, deliberately underbid transportation and disposal costs in order to get business for what was then a new disposal facility. The major difference between the Chemical Waste Management and Perland bids is the cost of transportation with the former bidding \$495,000 and the latter bidding

\$1,124,900, a difference of \$754,000. This difference is probably due to the fact that Chemical Waste Management Operated its own fleet of hazardous waste hauling trucks whereas Perland, a subsidiary of a construction contractor based in the northeast, would need to use contract haulers.

Costs for off-site disposal removal action will be in the range of \$8,000,000 to \$10,000,000 not including costs for agency oversight, water treatment, etc.

#### 4.3 On-Site Containment

On-site containment of CS-B sediments would protect public health and the environment by isolating the impacted sediments in a secure disposal facility located on property owned by Solutia on the west bank of Dead Creek, south of Site G and north of Judith Lane. The containment cell would be located immediately adjacent to Dead Creek with a capacity of 10,000 to 15,000 cubic yards. It would occupy approximately an acre of land and be about 20 feet high.

Regulatory issues associated with on-site containment can be handled in a six month planning time frame. Since impacted sediments would be moved within the area of contamination, RCRA Universal Treatment Standards would not apply. A number of TSCA design issues need to be addressed, however, there should be no regulatory issues provided there are engineering solutions to the technical issues. TSCA technical requirements include the following:

- Underlying soil equivalent to three feet of compacted clay with a permeability of  $1 \times 10^{-7}$  cm/sec
- Synthetic membrane liners must be compatible with PCBs, have a minimum thickness of 30 mils and must have adequate soil underlying and cover
- Depth to groundwater must be greater than 50 feet
- Floodplains, shorelands and groundwater recharge areas should be avoided
- If the site is below the 100 year flood elevation, surface water diversion dikes will be installed with an elevation two feet higher than the 100 year flood elevation



- If the site is above the 100 year flood elevation, diversion structures capable of handling a 25 year, 24 hour storm will be installed. Slopes will be designed so that erosion will not occur as floodwaters recede
- Topography should have low to moderate relief
- A compound leachate collection system is required for:
  - a lined pit excavated into permeable soil
  - a cell constructed on sand and gravel
  - semi-liquid or leachable wastes

Topography at the proposed location of the on-site containment cell is essentially flat with a topographic variation of less than five feet. Depth to groundwater at the site ranges from 10 to 15 feet. To meet the 50 ft. depth to groundwater requirement, the on-site containment cell will be built above grade on a base of three feet of compacted clay with an in-place permeability of  $1 \times 10^{-7}$ . Two 60 mil, geosynthetic membrane liners will be installed with a leachate collection system above the primary liner system and a leak detection system above the secondary liner system. HDPE, a material compatible with PCBs, will be used for the geosynthetic membranes. The cell will be built to RCRA minimum technology standards.

The proposed on-site containment cell is not located in a 100 year floodplain, however, it is located in the American Bottoms which is the floodplain of the Mississippi River. A floodwall and dike system contain the Mississippi River and it is unlikely that the site will be flooded unless the flood wall is breached. During the flood of July and August 1993, the largest flood in the history of the region, the proposed site of the containment cell was not flooded. Solutia's River's Edge Landfill, a closed disposal facility located outside the floodwall, was flooded during the 1993 but floodwaters did not overtop the cap nor was the cap damaged as the floodwaters receded. To ensure that flooding does not damage the proposed on-site containment cell, slopes will be flat to prevent erosion as floodwaters recede. A gravel cover may be used instead of a vegetated cover to provide additional erosion protection.

From a RCRA and TSCA perspective, on-site containment of CS-B sediments is a viable alternative. In addition, on-site containment of PCB-containing sediments is an established

practice in Region 5 with cells approved and/or constructed for projects at Waukegan Harbor, Grand Calumet River and Willow Run. Public acceptance of an on-site containment cell does not appear to be an issue. Public meetings indicate that flooding is the primary concern. Lack of progress on a remedy is also a concern. Local, state and federal elected officials were briefed on the plans for on-site containment of CS-B sediments and have expressed no objections to construction of an on-site cell.

Estimated construction cost of the 10,000 cubic yard, on-site containment cell, including engineering and construction management, is \$1,200,000. Excavation, dewatering and transfer of sediments is estimated to cost \$500,000 to \$1,000,000 (\$50 to \$100 per yard), resulting an estimated total project cost of \$2,000,000 to \$2,500,000 including a 15% contingency. A cell of this size can be constructed in two to four months depending upon weather conditions and availability of labor, equipment and materials.

## 5.0 Comparative Analysis

On-site containment is a protective and cost-effective remedy that can be implemented as a short-term removal action or as a long-term remedy. An on-site containment removal action can be implemented faster than off-site incineration or off-site disposal removal actions. It provides the same level of protection of public health and the environment as off-site incineration or off-site disposal at a significantly lower cost:

Off-Site Incineration	\$10,500,000 to \$16,900,000 <del>600,000,000</del>
Off-Site Disposal	\$8,000,000 to \$10,000,000
On-Site Disposal	\$2,000,000 to \$2,500,000

Risks associated with shipping 750 truck loads of PCB-containing sediments distances of 500 to 1,500 miles are eliminated by containing Creek Segment B sediments on site.

The area adjacent to Creek Segment B has been historically used for waste disposal so construction of an on-site containment cell is consistent with historical land use. Local, state and federal elected officials do not object to construction of an on-site containment cell.

Implementing an on-site containment removal action will demonstrate to the public that action is being taken after many years of study.

In summary, on-site containment is a protective, cost-effective removal action that is acceptable to the public. An on-site containment removal action can be implemented quickly, will meet the public's desire for action and will eliminate the potential for human exposure to impacted sediments in a shorter time frame than either an off-site incineration removal action or an off-site disposal removal action. For these reasons, on-site containment is the preferred removal action for sediments in Creek Segment B and Site M.

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